WARNING: You must return this section with your answer-book otherwise marks will be lost.

Write Your Examination Number here

AN ROINN OIDEACHAIS

7309

LEAVING CERTIFICATE EXAMINATION, 1997

PHYSICS — ORDINARY LEVEL

THURSDAY, 19 JUNE — AFTERNOON 2.00 to 5.00

Answer **all** questions in Section A.

Answer **two** questions from Section B and **three** questions from Section C.

SECTION A (120 marks)

Answer each question in this section.
Each question carries the same number of marks.
Write your answers in the spaces provided.
Write your examination number at the top.
Be sure to return this section of the examination paper, enclosing it in the answer-book you use in answering Sections B and C.

1. Answer *five* of the following items, (i), (ii), (iii) etc. In the case of each item write the letter corresponding to the correct answer in the box provided.

(i) Which of the following is the unit of work?

A. Watt
B. Volt
C. Joule
D. Kg m s^{-1}
E. Decibel.

Answer ☐ (6)

(ii) A body of weight 40 newtons requires a force of 10 newtons to begin to move on a surface. The coefficient of static friction between the body and the surface is:

A. 0.04
B. 0.25
C. 0.4
D. 4
E. 400

Answer ☐ (6)

(iii) Fig. 1 shows a graph of velocity against time. To which of the following does the graph apply?

A. A body which is accelerating
B. A body which is slowing down
C. A body which is at rest
D. A body which is moving at a constant speed
E. A body thrown vertically upwards and returning to the ground.

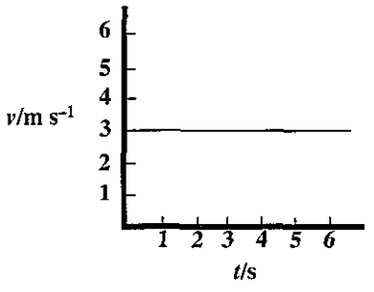

Fig 1

Answer ☐ (6)

(iv) When an object is inside the focus of a concave mirror, the image formed is

A. real, magnified and erect
B. real, magnified and inverted
C. real, diminished and inverted
D. virtual, magnified and inverted
E. virtual, magnified and erect.

Answer ☐ (6)

(v) The speed of sound

A. is the same as the speed of light
B. is a constant
C. depends on the medium through which the sound is passing
D. is greater than the speed of light
E. can be measured using a spectrometer.

Answer ☐ (6)

(vi) Fig. 2 shows a moving coil galvanometer with a small resistor R in parallel with it. The resistor R is

A. in parallel with the galvanometer and converts it to a voltmeter
B. in series with the galvanometer and converts it to a voltmeter
C. in parallel with the galvanometer and converts it to an ohmmeter
D. in parallel with the galvanometer and converts it to an ammeter
E. in series with the galvanometer and converts it to an ammeter.

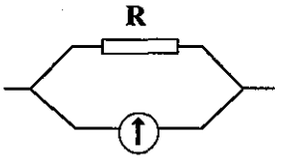

Fig. 2

Answer ☐ (6)

2. Answer *five* of the following.

(i) Force is a vector quantity because it has a..... and a ..... (6)

(ii) When an object is immersed in a fluid, the .....it experiences is equal to the ..... of the fluid displaced. (6)

(iii) Name the part of the human eye on which an image of an object is formed. ..... (6)

(iv) Infra-red radiation has a ..... wavelength than ultra-violet radiation but has a ..... frequency. (6)

(v) A structure which is well insulated has a ..... U-value. (6)

(vi) Name the Irish scientist who invented the induction coil.

Name ..... (6)

3. Answer *five* of the following.

(i) Give *two* properties of electrons. 1. .....

2. ..... (6)

(ii) What is meant by thermionic emission? .....

..... (6)

(iii) How are electrons accelerated in an X-ray tube? .....

..... (6)

(iv) Why does the target in an X-ray tube become very hot? .....

..... (6)

(v) Give one use of X-rays. .....

..... (6)

(vi) Name a piece of apparatus (other than an X-ray tube) in which a beam of electrons plays an important role.

..... (6)

4. Answer *five* of the following.

(i) Define capacitance. .....

..... (6)

(ii) What is the unit of capacitance? ..... (6)

(iii) A capacitor holds a charge of 10 μC on each plate when charged to a potential difference of 9 V. Calculate the capacitance of the capacitor.

..... (6)

(iv) X and Y are two plates of a charged capacitor as shown in Fig. 3. If the distance between the plates is increased what effect will this have on the reading on the voltmeter V?

..... (6)

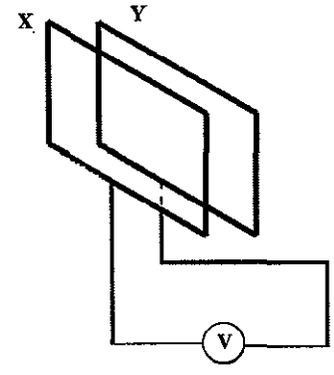

Fig. 3

(v) What is the name given to the insulating medium between the plates of a capacitor?

..... (6)

(vi) Give a common use of capacitors.

..... (6)

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PHYSICS — ORDINARY LEVEL

Section A is on a separate sheet which provides spaces for your answers. The completed sheet should be enclosed in your answer-book.

Write your answers to Sections B and C in your answer-book.

SECTION B (80 marks)

Answer **two** of the questions from this section.

Each question carries the same number of marks.

5. A student performed a laboratory experiment to measure g, the acceleration due to gravity.

(i) Draw a labelled diagram of the apparatus which could have been used in the experiment. (9)

(ii) State the measurements which the student would have made in the experiment. (12)

(iii) Explain how these measurements would be used to obtain a value for g. Write down the equation or formula which would have been used. (12)

(iv) Give a precaution which could be taken to achieve an accurate result in the experiment. (6)

6. A student performed an experiment to investigate the relationship between the frequency of vibration of a string and the length of the string. The tension in the string was kept constant.

The table below shows the data which the student obtained from the experiment.

Frequency, f / hertz	256	320	380	450	510	600	650
Length, l / metre	0.32	0.25	0.22	0.18	0.16	0.14	0.13

(i) Draw a diagram showing how the apparatus for this experiment might have been set up. Include at least two labels in your diagram. (9)

(ii) How would you vary the length of the vibrating string in this experiment? (6)

(iii) Use the information given in the table above to get a set of values for $1/l$. Use these values to draw a graph of f against $1/l$ on graph paper. What could you conclude from the graph? (24)

7. The apparatus shown in Fig. 4 was used in a laboratory experiment to measure the electrochemical equivalent of copper.

(i) Name the part labelled X in the diagram. (6)

(ii) State the term used to describe the liquid at Y in the diagram. (6)

(iii) What is the function of Z in the experiment? (6)

(iv) State four measurements which should be made in this experiment. (12)

(v) How is the electrochemical equivalent of copper calculated from the measurements in (iv) above? (9)

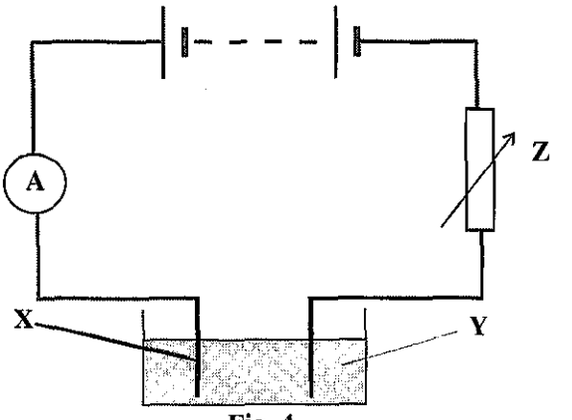

Fig. 4

SECTION C (200 marks)

Answer **three** questions from this section.

Each question carries the same number of marks.

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8. Define (i) force, (ii) acceleration. (12)

Sketch the apparatus which you would use in a laboratory experiment to demonstrate that acceleration is proportional to force when mass is constant. (9)

State the measurements which should be made in the experiment. (9)

Describe how you would make these measurements. (9)

Sketch the sort of graph which you would expect to obtain from the experiment. (6)

A body of mass 10 kg accelerates uniformly from rest to a speed of 20 m s^{-1} in a time of 5 seconds.

Calculate

(i) the acceleration of the body during this time; (6)

(ii) the force required to produce the acceleration; (6)

(iii) the distance travelled by the body in this time. (9)

9. (*a*) What is meant by thermometric property? (6)

Name a thermometric property. Outline an experiment to demonstrate the thermometric property which you have named. (12)

The temperature in the kitchen of a house is 18 °C and the temperature inside a freezer is –10 °C. What is the temperature difference between the kitchen and the freezer? (6)

The length of a column of mercury in a uniform glass tube is 2.0 cm at the freezing point of water and 25.0 cm at the boiling point of water. What will the temperature be when the length of the column is 16.0 cm? (9)

(*b*) Define specific heat capacity. (6)

Outline an experiment to measure the specific heat capacity of water *or* copper. (12)

A bath contains 80 kg of hot water at 65 °C. A certain mass of cool water which is at a temperature of 8 °C is added to the water in the bath. The final temperature of the mixture is 50 °C.

Assuming that there is no loss of heat to the surroundings, calculate

(i) the heat lost by the hot water; (6)

(ii) the mass of cool water which was added to the bath. (9)
(Specific heat capacity of water = 4 200 J kg^{-1} K^{-1})

10. What is meant by refraction? (6)

Explain with the aid of a diagram the terms (i) total internal reflection, (ii) critical angle. (12)

A sample of glass has a refractive index of 1.5. Calculate the value of the critical angle with air for the glass. (9)

A ray of light travels from air into a glass prism of refractive index 1.5, as shown in Fig. 5. Copy the diagram and show clearly the path of the ray through the prism and back into the air. Explain why the ray follows the path you have indicated. (15)

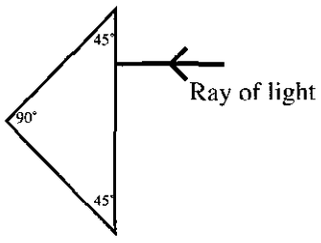

Fig. 5

Outline an experiment to measure the refractive index of glass. In your outline refer to (i) the apparatus used, (ii) the measurements made, (iii) how these measurements were made, (iv) how the refractive index was calculated. (24)

11. (*a*) State Ohm's law. (9)

Describe an experiment to show how the resistance of a conductor varies with temperature. (18)

State *two* other factors on which the resistance of a conductor depends. (6)

(*b*) The wiring diagram of a domestic electric fire is shown in Fig. 6.

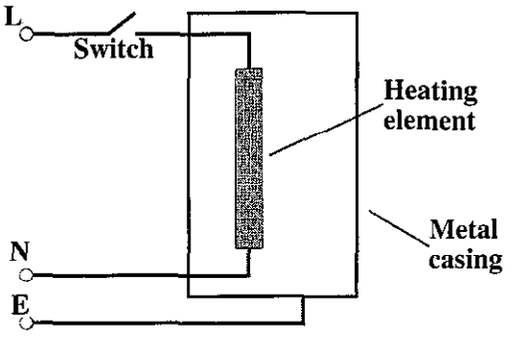

Fig. 6

(i) Explain the purpose of wire E in this diagram. (9)

(ii) Why is it important, when connecting this appliance to a 3-pin fused plug, that the wire L is connected to the live pin of the plug and the wire N to the neutral pin, rather than the other way around? (9)

(iii) State clearly the standard colour of the insulation on each of the wires L, N and E. (9)

Give *one* difference between the type of wire used in lighting circuits (i.e. for light switches and bulbs) and that used in power circuits (i.e. for wall sockets etc.) in a house. (6)

12. What is meant by electromagnetic induction? (9)

State *one* of the laws of electromagnetic induction. (9)

Fig. 7 shows a simple a.c. generator. The main parts are labelled A, B, C, D.

(i) Name each of the parts labelled. (12)

(ii) Give the functions of any *three* of the parts labelled. (18)

(iii) Sketch a graph showing how the voltage generated by the a.c. generator varies with time. (9)

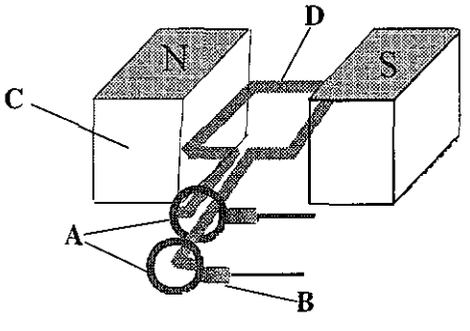

Fig. 7

State *one* energy conversion which occurs in an a.c. generator. (9)

13. Answer any *two* of the following.

(*a*) State the principle of conservation of energy. (6)

An object of mass 2 kg is released from rest at a height of 30 m above the ground. Taking g, the acceleration due to gravity, as 9.8 m s^{-2}, calculate

(i) the potential energy of the object before it is released, (9)

(ii) the kinetic energy of the object just before striking the ground, (6)

(iii) the speed with which the object strikes the ground. (12)

(*b*) Give an expression for the force on a current-carrying conductor in a magnetic field. (6)

Outline an experiment to demonstrate that a current-carrying conductor in an magnetic field experiences a force. (18)

Fig. 8 shows a straight horizontal wire of length 0.8 m carrying a current of 5.0 A. The wire is placed at right angles to a horizontal magnetic field of flux density 0.60 tesla. Calculate the force on the wire. (9)

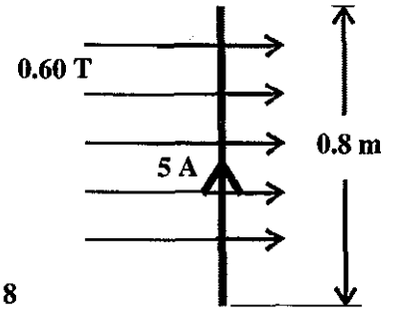

Fig. 8

(*c*) What is a semiconductor? (6)

The circuit in Fig. 9 uses a transistor to switch a lamp on and off.

Name the device X in Fig. 9. (6)

What happens to X when light is shone on it? (6)

Name the parts of the transistor labelled b, c, e. (9)

Name a device other than the lamp which could be switched on and off using a circuit similar to the one shown. (6)

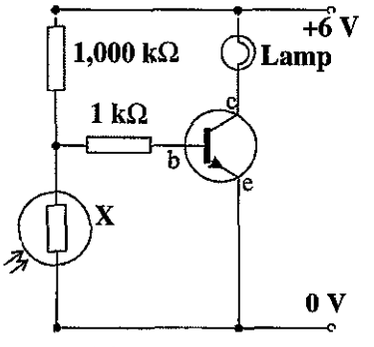

Fig. 9

(*d*) What is meant by (i) mass number, (ii) atomic number. (12)

Give the structure of the nucleus of an atom. (3)

What are radioisotopes? (6)

Explain the following statement.

"A certain radioisotope has a half life of 300 days". (6)

State *two* beneficial uses which are made of radioisotopes. (6)